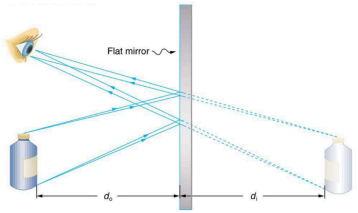
Introduction to Physical Science

Image Formation - Mirrors

Presented by Robert Wagner

Flat Mirrors

- Law of reflection - angle of reflection equals angle of incidence
- Rays can be traced backwards and the image appears to be behind the mirror - a virtual image



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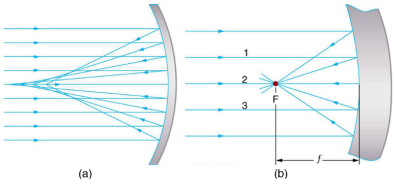
Concave Mirrors

- Spherical mirrors - light rays do not converge at the same point - no defined focal point
- Parabolic mirror - all light rays will converge at the focal point
- If a spherical mirror is small compared to its radius of curvature, it will behave like a parabolic mirror



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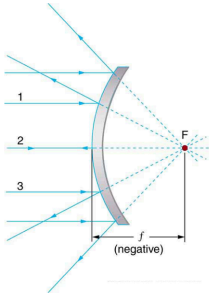
Concave Mirrors (2)

- Power of a mirror:
- Focal length of a mirror:
- R is the radius of curvature of the mirror
- Smaller radius of curvature => smaller focal length => more powerful mirror

Convex Mirrors

- Focal point of a convex mirror is behind the mirror
- Focal length and power will both be negative - diverging mirror



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Example

- A mirror has a radius of curvature of 20.0 m. What is the focal length and power of the telescope?
  - Draw a sketch (if applicable)
  - Identify known values
  - Identify equation
  - Enter values in the equation and solve

$$R = 20.0\ m$$

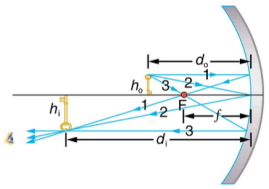
$$f = \frac{R}{2} = \frac{20.0}{2} = 10.0m$$

$$P = \frac{1}{f} = \frac{1}{10.0\ m}$$

$$P = 0.100\ m^{-1} = 0.100\ D$$

Ray Tracing Rules

- A ray approaching a concave converging mirror parallel to its axis is reflected through the focal point on the same side
- A ray approaching a convex diverging mirror parallel to its axis is reflected so that it seems to come from the focal point behind the mirror
- Any ray striking the center of the mirror is followed by following the law of reflection
- A ray approaching a concave converging mirror through its focal point is reflected parallel to its axis
- A ray approaching a convex diverging mirror by heading towards its focal point is reflected parallel to its axis



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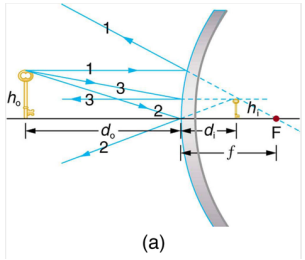

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Summary

- Flat mirror follow the law of reflection and form virtual images
- Concave converging mirrors have the focal point in front of the mirror. A convex diverging mirror has a focal point behind the mirror
- Ray tracing rules for mirror allow us to determine the location and size of the image formed.